MEMORANDUM

TO: Toni Jones, U.S. Environmental Protection Agency

FROM: Eastern Research Group, Inc.

DATE: November 3, 2011

SUBJECT: CISWI Emission Limit Calculations for Existing and New Sources for Reconsideration Proposal

BACKGROUND

The U.S. Environmental Protection Agency, under section 129 of the Clean Air Act (CAA), is required to regulate emissions of nine pollutants from Commercial and Industrial Solid Waste Incineration (CISWI) units: hydrogen chloride (HCl), carbon monoxide (CO), lead (Pb), cadmium (Cd), mercury (Hg), particulate matter (PM), dioxins/furans (PCDD/PCDF), nitrogen oxides (NO_x), and sulfur dioxide (SO_2).

On December 1, 2000, the EPA adopted new source performance standards (NSPS) and emission guidelines (EG) for CISWI units under Sections 111 and 129 of the Clean Air Act. In 2001 the EPA granted a petition for reconsideration regarding the definitions of "commercial and industrial waste" and "commercial and industrial solid waste incineration unit." In 2001, the United States Court of Appeals for the District of Columbia Circuit granted the EPA's voluntary remand, without vacatur, of the 2000 rule. In 2005, the EPA proposed and finalized the commercial and industrial solid waste incineration definition rule which, among other things, revised the definitions of "commercial and industrial waste" and "commercial and industrial waste incineration unit." In 2007, the United States Court of Appeals for the District of Columbia Circuit vacated and remanded the 2005 commercial and industrial solid waste incineration definition rule.

On March 21, 2011, the EPA promulgated revised NSPS and EG as its response to the voluntary remand that was granted in 2001 and the vacatur and remand of the commercial and industrial solid waste incineration definition rule in 2007. In addition, the standards re-development included the 5-year technology review of the new source performance standards and emission guidelines required under Section 129. Following that action, the Administrator received petition[s] for reconsideration and identified some issues that warranted further opportunity for public comment. In addition, data were received that enabled the EPA to revise the CISWI inventory of waste-burning kilns and energy recovery units to more accurately reflect the definition of non-hazardous secondary materials. For completeness, this memo retains the description of the maximum achievable control technology (MACT) floor determination and emission limit calculations for all subcategories. However, the incinerator and small remote incinerator subcategory emission limits remain largely unchanged from those in the March 2011 CISWI rule.

The EPA has developed a series of MACT floor emission limits to support that reconsideration. The purpose of this memorandum is to present the methodology and results of the MACT floor determinations and emission limit calculations for the CISWI source category. This memo is organized as follows:

I. Regulatory Options and Subcategories

II. Existing Sources
A. MACT Floors
B. Data Variability Analysis
C. Determining Emission Limits
III. New Sources
A. MACT Floors
B. Data Variability Analysis
C. Determining Emission Limits
IV. References

Appendix A Emission Limits Summary Tables
Appendix B Supporting Tables for MACT Floor Analysis
Appendix C Supporting Tables for Data Variability Analysis for Existing Units
Appendix D Supporting Data for Waste-burning Kiln Mercury Analysis
Appendix E Supporting Tables for Data Variability Analysis for New Units
Appendix F CO Span Adjustments
Appendix G Method Detection Limit Guidance

I. REGULATORY OPTIONS AND SUBCATEGORIES

In the 2000 CISWI rule, there were no subcategories. However, in the final and the reconsideration rulemakings, there are several different types of units that will now be subject to regulation as CISWI units that were previously not subject to CISWI standards. At proposal, the EPA considered two regulatory options in proposing the CISWI standards: Option 1 – Evaluate MACT floors assuming no subcategories (similar to the 2000 CISWI standards); or Option 2 – Evaluate MACT floors for each subcategory of CISWI unit that will be subject to the proposed regulations. Public comments received after proposal not only supported the need for subcategories, but indicated that additional subcategories were warranted. The EPA found these comments to be persuasive as to the need for some additional subcategories. Therefore, the CISWI inventory has been grouped into five primary subcategories. The five subcategories that were developed are listed below, followed by an explanation of the reasons for creating each subcategory:

- Incinerators (general waste burning units without integral heat recovery),
- Energy recovery units – solids (waste burning units that recover thermal energy),
- Energy recovery units – liquid/gas (waste burning units that recover thermal energy),
- Waste-burning kilns (kilns burning solid waste, including tires classified as solid waste), and
- Small, remote incinerators (small incineration units located in remote areas).

Incinerators: Incinerators, which are the units currently regulated by the 2000 CISWI rule, are used to dispose of solid waste materials and emissions are a function of the types of materials burned. Incinerators are designed without integral heat recovery (but may include waste heat recovery). While there are different designs, they all serve the same purpose; reduction in the volume of solid waste materials. Incinerators can be operated on a batch or continuous basis. The same types of add-on controls, including fabric filters, wet scrubbers, selective noncatalytic reduction (SNCR), and activated carbon injection, can be applied to most incinerators. Although the composition of the materials combusted is highly variable and is a key factor in the profile of emissions, we determined it was not appropriate to further subcategorize incinerators because the sources in this subcategory are sufficiently similar such that the incinerators can achieve the same level of performance for the nine regulated pollutants.

Energy-recovery units (liquid/gas, solids, solids-biomass, solids-coal): Energy recovery units (ERUs) combust solid waste materials as a percentage of their fuel mixture and are designed to recover thermal energy in the form of steam or hot water. Energy recovery units include units that would be considered boilers and process heaters if they did not combust solid waste. The design, operating, and emissions information that the EPA has reviewed indicates differences in unit design that distinguish different types of ERUs. Data indicate that there are generally significant design and operational differences between units that burn coal, biomass, liquid, and gaseous fuels. Energy recovery units are therefore designed for specific fuel types and will encounter problems if a fuel with characteristics other than those originally specified is fired. Many ERUs in the database are indicated to co-fire liquids or gases with solid fuels, but, in actuality, most of these boilers commonly use fuel oil or natural gas as a startup fuel only and then operate on solid fuel during the remainder of their operation. In contrast, some co-fired units are specifically designed to fire combinations of solids, liquids, and gases. Changes to the fuel type would generally require extensive changes to the fuel handling and feeding system (e.g., a stoker using wood as fuel would need to be redesigned to handle fuel oil or liquid wastes). Additionally, the burners and combustion chamber would need to be redesigned and modified to handle different fuel types and account for increases or decreases in the fuel volume. In some cases, the changes may reduce the capacity and efficiency of the ERU. An additional effect of these changes would be extensive retrofitting needed to operate using a different fuel; therefore, the design of the ERU impacts the degree of combustion.

In our investigations resulting from public commenters' statements, we concluded that the data were sufficient for determining that a distinguishable difference in performance exists based on unit design type. Therefore, because different types of units have different emission characteristics which may influence the feasibility or effectiveness of emission control, they should be regulated separately (i.e., subcategorized) for affected pollutants. Accordingly, we have subcategorized ERUs based on unit design in order to account for these differences in emissions and applicable controls. The two primary ERU subcategories are units designed to burn solid wastes (solids) with other solid fuels, and units designed to burn liquid wastes with liquid or gaseous fuel (liquid/gas). The ERU solids subcategory is further subcategorized into units designed to burn coal and units designed to burn biomass or predominantly non-coal solid materials for Cd, Pb, PCDD/PCDF, CO, NOx, and SO_2 to address design differences and feasibility or effectiveness of emission control between these types of units as commenters have suggested. The subcategorization for these pollutants is also compelled by the data available for the solid fuel sources. Specifically, coal fired ERUs submitted exclusively CEMS data for CO, NOx, and SO_2, and biomass fired ERUs submitted almost exclusively stack test data for these pollutants. We are unable to convert the vast majority of CEMS data into equivalent stack test data and the converse is true as well. Pursuant to CAA section 129(a)(2), the EPA must establish emission standards for existing sources based on the average emissions limitation achieved by the best-performing 12 percent of sources. Because the data for CO, NOx, and SO_2 from the biomass and coal fired ERUs are not in consistent formats, we would have to ignore a subset of the available data in establishing the floors for these pollutants if we did not further subcategorize solid fuel ERUs. We therefore think it is reasonable to further subcategorize these units for CO, NOx, and SO_2 so the standards are reflective of the data available to the EPA, and we are properly accounting for the different emissions characteristics associated with the different types of fuels. Finally, we have also subcategorized emission limits for PM, Cd, Pb and PCDD/PCDF as combustion-based pollutants in an attempt to be consistent with subcategorization used in the major source boiler NESHAP. After assessing the points raised by the petitioners, the EPA determined that PM and other metal emissions are influenced both by fuel type and design. Therefore, it is appropriate to treat these pollutants as combustion-based pollutants.

These subcategories are based on the primary fuel that the ERU is designed to burn. We are aware that some ERUs burn a combination of fuel types or burn a different fuel type as a backup fuel if the primary fuel supply is curtailed. However, ERUs are designed based on the primary fuel type (and perhaps to burn a backup fuel) and can encounter operational problems if another fuel type that was not considered in its design is fired at more than 10 percent of the heat input to the unit. Therefore, we subcategorized ERUs that burn at least 10 percent coal (on an annual heat input basis) as being in solid fuel/coal subcategory, with the remaining solid ERUs being in the biomass subcategory for ERUs.

Since promulgation, data were received that enabled us to determine that five ERUs at promulgation are no longer burning solid waste based on the current definition and those units have been removed from the CISWI inventory. Furthermore, there were three units that were added to the CISWI inventory because they provided data indicating that they would likely be classified as CISWI units.

Waste-burning kilns: Waste-burning kilns are fundamentally different than any other unit being regulated under CISWI. Kilns of all types are physically larger than incinerators with comparable heat input. Kiln design and operation are also different from those of incinerators. For example, the design is typically a rotating cylindrical kiln with a fuel burner on one end and raw materials being fed in the other (cold) end. Fuel (particularly solids such as tires) may also in some cases be fed at the mid kiln point. Some kilns also have a large preheater tower with a precalciner that is an additional firing point for both fossil and waste fuels. The temperature profile of kilns is critical in order to produce a saleable product, and differs from that of incinerators both in terms of residence time and absolute temperature. Another key distinction from incinerators and other CISWI subcategories is that for cement kilns, the source of most of the emitted pollutants is typically the raw materials, not the fuels, and emissions from the raw materials and the solid wastes and fuels are comingled and emitted together. As a result of all these distinctions, waste-burning kilns have a very different emissions profile than other CISWI subcategories, justifying separate standards. See 74 FR at 21145 ("Normally, any basis for subcategorizing must be related to an effect on emission, rather than to some difference among sources which does not affect emissions performance").

Since promulgation, there were eleven additional kilns that were identified as being waste-burning kilns. These kilns and their available data were added to the CISWI inventory for reanalysis of the waste-burning kiln subcategory.

We also reconsidered the comments that the kiln subcategory should be further subcategorized for one pollutant, CO. We are proposing to subcategorize into two kiln types; long kilns (which include both dry and wet process kilns) and kilns that have preheaters (with or without precalciners). This subcategorization is based on the demonstrated difference in combustion and CO formation characteristics of long kilns and preheater or preheater/precalciner kilns. Of these 23 waste-burning kilns, 13 are long kilns and 10 are preheater/precalciner kilns. The memorandum "Waste-burning kiln design and carbon monoxide emission concentrations" discusses the data the EPA used in determining whether kiln design subcategories are justified with respect to carbon monoxide emissions.

Small, remote, incinerators: These are batch-operated units that combust less than 3 tons of waste per day and are located more than 25 miles from the nearest municipal solid waste (MSW) landfill. To the extent that these units are located in Alaska, a major difference in these types of units is the inability to operate a wet scrubber in the northern climates and the lack of availability

of wastewater handling and treatment utilities. We believe this would impact their ability to meet emission limits for pollutants controlled by wet scrubbers. In addition, because of the remote location, these units do not have lower-cost alternative waste disposal options (i.e., landfills) nearby and emissions associated with transporting the solid waste could be significant.

II. EXISTING SOURCES

A. MACT Floors

Emissions standards for existing units may be less stringent than standards for new units, but "shall not be less stringent than the average emissions limitation achieved by the best performing 12 percent of units in the category." CAA section 129 (a)(2). For existing sources, the MACT floor for each subcategory of sources was calculated by ranking the emission test results from units within the subcategory from lowest emissions to highest emissions (for each pollutant) and then taking the numerical average of the test results from the best performing (lowest emitting) 12 percent of sources. That is, the overall 3-run test average values for each existing unit for each pollutant were compiled and ranked from lowest to highest to identify the best performing 12 percent of sources within the subcategory on a pollutant-by-pollutant basis. Because the number of units in different subcategories may be different, the number of units that represent the best performing 12 percent of units for different subcategories vary. Also, mathematically, the number of units that represent the best performing 12 percent of the units in a subcategory will not always be an integer. To ensure that each MACT standard is based on at least 12 percent of the units in a subcategory, the EPA has determined that it is appropriate to always round up to the nearest integer when 12 percent of a given subcategory is not an integer. For example, in the incinerator subcategory, 12 percent of the 26 units is 3.12 units, so standards were established based on the best performing 4 units.

In developing standards for waste burning kilns for the final rule, we used best efforts to estimate which units would have been classified as CISWIs (i.e. units combusting solid waste) had the final definition of non-hazardous solid waste been in place at the time of the performance testing. The standards (and, necessarily, the pool of best performers establishing the floors for each standard) are based on the performance of this universe of sources.[1] In evaluating which sources would have been classified as CISWI units had the new definition of solid waste been effective, the EPA used the information currently available on which non-hazardous secondary materials the sources combust, as supplemented by information obtained from public comment and further information gathered by the EPA after the public comment period of this rule.This inventory was reevaluated following promulgation of the new definition of solid waste and, as a result, an additional 11 kilns were added to the CISWI waste-burning kiln inventory.

[1] Section 112 (d) MACT standards are based on the performance of sources at a moment in time (or over some demarcated timeframe), and the EPA therefore bases those standards on performance of sources classified as part of the source category at the time their performance is evaluated (i.e. the time of performance testing). However, the EPA could not use this approach for this rule. Sources combusting non-hazardous secondary materials, the best example being alternative fuels, were not classified as CISWIs absent a regulatory definition of solid waste classifying such secondary materials. In order to issue the CISWI standards by the mandated promulgation deadline, the EPA deviated from its usual practice and based the standards on the performance of devices which would have been classified as CISWIs had the final waste definition been in place at the time of the performance testing even though these sources were not CISWIs at the time. There was no approach that would be based on the sources' actual status that would have allowed the EPA to complete this CISWI rule by the time of the judicially mandated deadline for promulgation.

Table A-1 presents the results of the EG floors for the various statistical intervals considered and the final emission limits for each pollutant in each subcategory. Subcategory-specific notes follow. For additional reference, tables in Appendix B present all average pollutant concentrations and unit rankings for each pollutant.

1. Waste-burning Kilns

Unit rankings for each pollutant are shown in Tables B-1. The top 3 cement kilns (12 percent of the 23 total existing cement kilns) were included in the MACT floor for all pollutants except CO. Because kilns were further subcategorized for CO, CO MACT floors comprise the top 2 preheater/precalciner kilns (12 percent of the 10 existing preheater/precalciner kilns) and the top 2 long kilns (12 percent of the 12 existing long kilns). Note that the PM rankings are based on the lb/ton clinker values from each unit, weighted to reflect the percentage of time the raw mill is operated (if the unit has a raw mill). The raw mill operating information comes from the Portland Cement NESHAP database for the cement kilns that would have been classified as waste-burning kilns had the revised definition of solid waste been promulgated and applicable to those kilns. Appendix B-1 contains the spreadsheet showing how PM concentration data are converted to lb/ton clinker produced values.

2. Energy Recovery Units – Solids

Unit rankings for each pollutant are shown in Tables B-2 through B-4. The top 4 solids-burning energy recovery units (12 percent of the 26 existing ERUs) were included in the MACT floor for solids. For solids-coal, the top unit was included (12 percent of 5 existing units), and for biomass, the top 3 units were included (12 percent of 21 existing units). As discussed above, all pollutants except for Hg and HCl have limits based on whether the unit is in the ERU-coal or ERU-biomass subcategory. The limits for CO_2, NO_X, and SO_2 for the coal subcategory incorporate hourly continuous emissions monitoring data for one of the best performing units. These were used in the analysis since test data were unavailable. In these instances, each hour of data was treated as an individual test run.

3. Energy Recovery Units – Liquid/Gas

Unit rankings for each pollutant are shown in Table B-5. The top energy recovery unit (12 percent of the 6 total existing energy recovery units) were included in the MACT floor.

4. Incinerators

Unit rankings for each pollutant are shown in Tables B-6. The top 4 incinerators (12 percent of the 26 total existing incinerators) were included in the MACT floor.

5. Small, Remote Units

Unit rankings for each pollutant are shown in Table B-7 The top 2 small, remote units (12 percent of the 14 total existing incinerators) were included in the MACT floor.

B. Data Variability Analysis

Once the best 12 percent of units were identified for each source category and pollutant, the individual test run data for these units were compiled, and a statistical analysis was conducted to calculate the average and account for variability in order to determine the MACT floor emission limit.

The first step in the statistical analysis included a determination of the whether the data used for each MACT floor calculation were normally or log-normally distributed, followed by calculation of the average, the 99^{th} percent upper limit (UL) for incinerators, and the 99^{th} percent upper

prediction limit (UPL) for energy recovery units and waste-burning kilns. If the data were normally distributed (e.g., similar to a typical bell curve), then the equation to calculate UL was applied to the data. If the data were not normally (i.e. log-normally) distributed (for example if the data were asymmetric or skewed to the right or left), then a data transformation was performed to normalize the data prior to computing the UL or UPL. When the data distribution was found to be log-normal, the data were transformed by taking the natural log of the data prior to calculating the UL or UPL value. Two statistical measures, skewness and kurtosis, were examined to determine if the data were normally or log-normally distributed. Since proposal, the methodology has been revised to use the lognormal distribution when the normal distribution is not clearly indicated based on the skewness and kurtosis tests to be more consistent with the EPA's guidance in "Guidance for Data Quality Assessment: Practical Methods for Data Analysis" EPA/600/R-96/084, July 2000. A summary of the variability analysis for existing units is presented in Table A-3. Detailed analyses with run data can be found in Appendix C.

C. Determining Emission Limits

Emission limits for existing units were determined based on the 99th percent UL (for incinerators) and the 99th percent UPL (for energy recovery units and waste-burning kilns) of the compiled run data for each pollutant and are presented in Table 1 below.

Table 1. Final CISWI MACT Floor Limits for Existing Sources

Pollutant (units)	Subcategory				
	Incin-erators	**Energy recovery units – solids**	**Energy recovery units – liquid/gas**	**Waste-burning kilns**	**Small, remote incin-erators**
HCl (ppmv)	29	0.50	14	3.0	220
CO (ppmv)	36	490 (biomass units) /46 (coal units)	36	120 (long kilns) / 410 (preheater/ precalciner)	20
Pb (mg/dscm)	0.0036	0.0019 (biomass units) / 0.0031 (coal units)	0.096	0.0043	2.7
Cd (mg/dscm)	0.0026	0.00078 (biomass units) / 0.058 (coal units)	0.023	0.00082	0.61
Hg (mg/dscm)	0.0054	0.0020	0.0013	0.011	0.0057
PM, filterable (mg/dscm)	34	11 (biomass units) / 86 coal units	110	9.2	230

Pollutant (units)	Subcategory				
	Incin-erators	Energy recovery units – solids	Energy recovery units – liquid/gas	Waste-burning kilns	Small, remote incin-erators
PCDD/PCDF, total (ng/dscm)	4.6	0.52 (biomass units) / 0.51 (coal units)	2.9	3.6	1200
PCDD/PCDF, TEQ (ng/dscm)	0.13	0.12 (biomass units) / 0.075 (coal units)	0.32	0.075	57
NO_X (ppmv)	53	290 (biomass units)/ 340 (coal units)	76	630	240
SO_2 (ppmv)	11	7.3 (biomass units)/ 650 (coal units)	720	830	420

As discussed at proposal, the UL computation assumes that the data available represents the entire population of data from the best-performing CISWI units used to establish the standards. We have concluded that this statement applies to the incinerator and small remote incinerator subcategories, since we believe our inventory of these units is more certain than is our inventory of ERUs and waste-burning kilns for several reasons. In the 2000 CISWI rule, the EPA only regulated solid waste incineration units that operated for the sole purpose of disposing of waste. Many incinerators subject to the 2000 CISWI rule ceased operation before the compliance date for those standards. Once the revised CISWI standards are finalized, these types of solid waste incineration units (i.e., incinerators and small remote incinerators) will either comply with the revised CISWI standards or cease operation, much as they did in response to the 2000 standards. The same is not necessarily correct for units in the ERUs and waste-burning kilns subcategories. For those sources, once the CISWI standards are promulgated, they will likely either comply with the CISWI standards or cease burning solid waste and comply with the applicable NESHAP. We think units in those subcategories will generally not cease operation. Furthermore, because incinerator and small remote incinerator units' sole purpose is waste disposal, the only practical manner in which additional sources will be added to the inventory is through new construction. Again, this is different than for ERUs and waste-burning kilns because, for those subcategories, additional units may be added if existing boilers (and process heaters) and cement kilns begin combusting solid waste and thereby become ERUs and waste-burning kilns, respectively. For these reasons, we believe we have a complete inventory of units in the incinerators and small remote incinerators subcategories.

We sent Phase II testing requests to all incinerator and small remote incinerator units that are in our inventory. We required testing for all incinerator and small remote incinerator units, making

allowances for identical units from a facility to only test one unit, and not each identical unit. Therefore, our data represent the entire population of data for these two subcategories. For this reason, we believe the UL is the appropriate statistical approach for the incinerators and small remote incinerators subcategories. The 99 percent UL represents a value that 99 percent of the data in the MACT floor population would fall below, and therefore accounts for the run-to-run and test-to-test variability observed in the MACT floor data set.

The UL was calculated by the following equation:

$$UL = x + t(0.99, n) * s$$

Where:

x	=	average of the data.
$t(0.99,n)$	=	t-statistic.
n	=	number of data points in the population.
s	=	standard deviation.

For ERUs and waste-burning kilns, however, we recognize that our data may not represent the entire population of units. As stated above, there is greater uncertainty involved in determining the universe of sources in these two source categories because we cannot be certain that we have identified all the units that would be considered to be burning solid waste, had the newly-adopted definition fo solid waste been promulgated and effective at the time of testing. We also do not know whether the units we have identified will continue to burn waste after the final CISWI standards are issued. Unlike incinerators and small remote incinerators, the primary purpose of waste-burning kilns and ERUs is the production of a product or generation of energy, not the disposal of waste. Therefore, operators will decide whether it is economically feasible to continue or start combusting solid waste to support their industrial process and, if they decide that it is not, they will use traditional fuels or non-waste inputs instead of solid waste. For example, an ERU that is combusting solid waste that has little or no cost may decide that compliance with CISWI is an economically viable option compared to purchasing traditional fuels at market rates; but, if the costs of compliance with CISWI exceed the costs of traditional fuel, the source will likely cease burning solid waste. Conversely, a boiler that currently combusts only traditional fuels may be presented with a solid waste fuel option that makes it to their economic advantage to begin combusting solid waste. For these reasons, the population of units in the ERU and waste-burning kiln subcategories is inherently uncertain. We have for these reasons concluded that a prediction interval (e.g., UPL) is more appropriate for these two subcategories.

A prediction interval for a future observation is an interval that will, with a specified degree of confidence, contain the next (or some other pre-specified) randomly selected observation from a population. In other words, the prediction interval estimates what the upper bound of future values will be, based upon present or past background samples taken. The UPL consequently represents the value which we can expect the mean of future observations (3-run average) to fall below within a specified level of confidence, based upon the results of an independent sample from the same population. In other words, if we were to select at random a future test condition from any of the top 12 percent (MACT floor pool) of sources (average of 3 runs), we can be 99 percent confident that the reported level will fall at or below the UPL value. Use of the UPL is appropriate in this rulemaking for these two subcategories because it sets a limit any single or future source can meet based on the performance of members of the MACT floor pool.

The UPL was calculated by the following equation:

$$UPL = \bar{x} + t(0.99, n-1) \times \sqrt{s^2 \times \left(\frac{1}{n} + \frac{1}{m}\right)}$$

Where:

$\bar{x}$	=	Mean of the sample data set
n	=	Number of test runs
m	=	Number of test runs in the compliance average
s2	=	Observed variance
t	=	Student t distribution statistic

The calculated existing source UL or UPL values (which are based on the emissions data from the best performing 12 percent of sources and account for variability) were selected as the final emission limits for the nine regulated pollutants in each subcategory. In establishing the limits, the UL values were rounded up to two significant figures. For example, a value of 1.42 would be rounded to 1.5 (as has been done for other CAA section 129 rules) because a limit of 1.4 would be lower than the calculated MACT floor value. The summary results of the UL and UPL analysis and derivation of the final emission limits for existing units are presented in Table A-3.

At proposal, the EPA suggested that at very low emission levels where emissions tests result in nondetect values, the inherent imprecision in the pollutant measurement method has a large influence on the reliability of the data underlying the MACT floor emission limit. See 75 FR 31943. Because of sample and emission matrix effects, laboratory techniques, sample size, and other factors, MDLs normally vary from test to test for any specific test method and pollutant measurement. The confidence level that a value measured at the detection level is greater than zero is about 99 percent. The expected measurement imprecision for an emissions value occurring at or near the MDL is about 40 to 50 percent. Pollutant measurement imprecision decreases to a consistent level of 10 to 15 percent for values measured at a level about three times the MDL. The approach the EPA has used to account for measurement variability in t calculating the final limits begins by defining a MDL that is representative of the data used in the data pool. The first step in the approach is to identify the highest test specific MDL reported in a data set that is also equal to or less than the average emission calculated for the data set. This approach has the advantage of relying on the data collected to develop the MACT floor emission limit, while to some degree, minimizing the effect of a test(s) with an inordinately high MDL (e.g., the sample volume was too small, the laboratory technique was insufficiently sensitive or the procedure for determining the detection level was other than that specified). The second step is to determine the value equal to three times the representative MDL and compare it to the calculated MACT floor emission limit. If three times the representative MDL were less than the calculated MACT floor emission limit, we concluded that measurement variability is adequately addressed, and we did not adjust the calculated MACT floor emission limit. If, on the other hand, the value equal to three times the representative MDL was greater than the calculated MACT floor emission limit, we concluded that the calculated MACT floor emission limit does not account entirely for measurement variability. We therefore used the value equal to three times the MDL in place of the calculated MACT floor emission limit to ensure that the MACT floor emission limit accounts for measurement variability and imprecision. The results of these analyses are presented in the summary tables of Appendix A as well as the individual variability calculation spreadsheets of Appendix C (and Appendix E for new sources).

In a similar concern, extremely low carbon monoxide values were reinvestigated to analyze whether the span of the test used was capable of accurately reading the reported value, and if not, were adjusted to provide a value in which there can be more confidence . While this adjustment

did not necessarily affect the floor calculations in every case, the results of this analysis and resulting changes to the database are presented in Appendix F.

The measurements for HCl from waste-burning kilns are very close to the detection limit for analytic Method 321 actually calculated in the field for HCl. We have implemented a procedure for adjusting limits to account for measurement variability using data at the detection limit. A similar exercise was also performed for the Portland Cement NESHAP, which results in a floor of 3 ppmvd for both new and existing waste-burning kilns for HCl, adjusted to a dry basis at 7 percent oxygen. This represents the lowest level that can be reliably measured using this test method. See 75 FR at 54984.

Furthermore, since promulgation, the EPA has reviewed the reference method detection limits for Hg and PCDD/PCDF. This review and analysis used the similar three times the detection limit as in the final CISWI rule, but instead relied on a much larger data set of emission test reports to generate a more widely applicable and standard set of method detection limits. Appendix G presents the memorandum of this analysis, and the method detection limits. In our analysis for CISWI, the industrial boiler data set were those that were used, and in every case, the four dry standard cubic meter concentrations were used. Note however, that the Appendix G values are at zero percent oxygen, so these were adjusted to 7 percent oxygen based on the average stack oxygen level of each CISWI subcategory. The Appendix A spreadsheets contain the average stack oxygen values used to make this adjustment.

The Hg standard for waste-burning kilns reflects 30 days of data for all Hg inputs, reasonable estimates of control device performance (for the few controlled sources), plus a reasonable statistical methodology to account for variability (including variability of Hg content of kiln inputs). the EPA also used a pooled variability factor (pooling variability for all kilns in the MACT floor pool), which increased variability estimates. This analysis is based upon data collected for development of the final Portland Cement NESHAP, but screened such that the CISWI analysis used only the data from kilns that would have been identified as CISWI units had the newly-adopted solid waste definition been promulgated and effective at the time of performance testing and accounting for inter-quarry variability , and converted to a concentration basis for consistency with the CISWI standards. The data used in this particular analysis are confidential business information, so the analysis presents randomly assigned identification for these data. The limit calculated for existing sources is 35.081 lb/ million tons feed, which assuming 1.65 tons feed per ton clinker and 54,000 dry standard cubic feet per ton clinker, results in a limit of 0.011 mg/dscm at 7 percent oxygen. The result for new sources is 0.0037 mg/dscm. This analysis is presented separately in Appendix D.

III. NEW SOURCES

A. MACT Floors

The approach for new sources was similar to that used with the existing sources, except the best performing unit's data within a subcategory was used to calculate the MACT floor emission limit instead of the average of the best performing 12 percent of units. In summary, the approach ranks individual CISWI units based on actual performance and establishes MACT floors based on the best performing source for each pollutant and subcategory, with an appropriate accounting for emissions variability.

Table A-2 presents the NSPS floors for each pollutant for each subcategory.

B. Data Variability Analysis

Similar to the analysis performed to determine EG limits, run-specific data for the best performing unit were compiled on a pollutant-by-pollutant basis and assessed to account for variability. A summary of the statistical results for the NSPS data variability analysis is shown in Table A-4. For further reference, Appendix E presents individual run data and associated analyses for each pollutant within each subcategory.

C. Determining Emission Limits

Emission limits for new sources, also based on the 99th percent UL (for incinerators) and the 99th percent UPL (for energy recovery units and waste-burning kilns) of the compiled run data for each pollutant, are presented in Table 2 below. For further reference, the summary results of the UL and UPL analysis and derivation of the final emission limits for new units are presented in Table A-2 in Appendix A. Table A-4 in Appendix A shows the emission limit calculations for new sources.

As noted in Table A-2, there were certain instances where the calculated emission limit for new sources was actually greater (less stringent) than the limit calculated for that pollutant for existing sources. In these cases, the limit for existing sources was also adopted for new sources. In a couple instances for waste-burning kilns and energy recovery units, the data available for similar sources was determined to be better suited for calculating the new source limits. Notably, this is the case for NOx for waste-burning kilns, and for Hg and PCDD/PCDF for ERU-liquid/gas units.

Table 2. Final CISWI MACT Floor Limits for New Sources

Pollutant (units)	Subcategory				
	Incin-erators	**Energy recovery units – solids**	**Energy recovery units – liquid/gas**	**Waste-burning kilns**	**Small, remote incin-erators**
HCl (ppmv)	0.091	0.50	14	3.0	200
CO (ppmv)	12	160 (biomass units)/ 46 (coal units)	36	90 (long kilns) / 320 (preheater / precalciner)	12
Pb (mg/dscm)	0.0019	0.0019 (biomass units) / 0.0031 (coal units)	0.096	0.0043	0.26
Cd (mg/dscm)	0.0023	0.00014 (biomass units) / 0.058 (coal units)	0.023	0.00082	0.61
Hg (mg/dscm)	0.00084	0.0020	0.00091	0.0037	0.0035

Pollutant (units)	Subcategory				
	Incin-erators	**Energy recovery units – solids**	**Energy recovery units – liquid/gas**	**Waste-burning kilns**	**Small, remote incin-erators**
PM, filterable (mg/dscm)	18	5.1 (biomass units) / 86 (coal units)	110	8.9	230
PCDD/PCDF, total (ng/dscm)	0.058	0.52 (biomass units) / 0.51 (coal units)	No limit	0.51	1200
PCDD/PCDF, TEQ (ng/dscm)	0.13	0.076 (biomass units) / 0.075 (coal units)	0.093	0.075	31
NO_X (ppmv)	23	290 (biomass units)/ 340 (coal units)	76	200	78
SO_2 (ppmv)	11	7.3 (biomass units)/ 650 (coal units)	720	130	1.2